

REMARKS

Claims 1 - 6, 8 - 11, 13 - 17, 19, 30, 32 - 38, 40, 41, and 43 - 78 are now in this application. Claims 1 - 6, 17, 19, 25 - 27, 30 - 33, 39 and 42 are rejected. Claims 7 - 16, 18, 20 - 24, 28, 29, 34 - 38, 40 and 41 are objected to. Claims 7, 12, 18, 20 - 29, 31, 39, and 42 are cancelled herein. New claims 43 - 78 are added. Claims 1 - 6, 8 - 11, 13 - 17, 19, 30, 32 - 38, 40, and 41 are amended herein to express certain aspects of the invention in alternative wording, to address matters of form unrelated to substantive patentability issues, and to amend the dependencies of certain dependent claims consistent with the numbers of newly added claims. Other formal matters, including ensuring that all terms have correct antecedent basis where required, are attended to that were not addressed by the Examiner and accordingly are considered unrelated to substantive patentability issues. No new matter is added by any of the foregoing amendments to the claims or by any of the newly added claims.

In the Office Action, claims 7 - 16, 18, 20 - 24, 28, 29, 34 - 38, 40 and 41 were objected to as being dependent upon a rejected base claim, however, the Examiner indicated that they would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Certain of the objected-to claims are multiple dependent claims. In order to make them allowable while retaining the full scope of the original claims, it is necessary to rewrite certain of the claims as a separate independent claim incorporating each of the respective limitations of the several base claims in the original multiple dependent claim and/or changing the dependencies of certain dependent claims.

The following table is provided to assist the Examiner in tracking the new independent claims that have been added and identifying their subject matter content to the original comparable claims which the Examiner objected to and for which the Examiner indicated allowability if amended to independent form. Additional comments on certain claims are also provided to assist the Examiner.

Columns 1 and 4 show claim numbers. Bold indicates claim in application after entry of Amendment, and type after amendment.

Columns 2 and 5 show action taken in this Amendment.

Columns 3 and 6 give additional comments.

I (or Ind) = Independent claim

D (or Dep) = Dependent claim

MD (or MDep) = Multiple dependent claim

Amended = claim has been amended by this Amendment

Text amended = amendment to text of claim other than change in dependencies

(NC) indicates no change in dependencies of claim as result of amendment.

Dep to MDep indicates claim converted from dependent to multiple dependent claim by this Amendment.

e.g., #2 > #2, #3, #4, etc. shows changes in dependencies (e.g., claim dependent on claim 2 changed to multiple dependent claim on claims 2, 3, 4, etc.)

CLAIM	ACTION	REMARKS	CLAIM	ACTION	REMARKS
1 I	Amended	Text amended	40 MD	Dep to MDep	Text amended; 28 > 59,60
2 MD	Amended	Text amended; Dep 1 (NC)	41 MD	Dep to MDep	Text amended; 29 > 61,62
3 I	Amended	Text amended	42	Cancelled	
4 MD	Amended	Text amended; Dep 2 (NC)	43 I	New Ind	Old 1 + 7
5 MD	Amended	Text amended, Dep 1 - 4 (NC)	44 I	New Ind	Old 3 + 7
6 MD	Amended	Text amended, Dep 1 - 4 (NC)	45 I	New Ind	Old 1 + 12
7	Cancelled		46 I	New Ind	Old 3 + 12
8 MD	Amended; Dep to MDep	Text amended, 7 > 43,44,63,64	47 I	New Ind	Old 1 + 18
9 D	Amended	Text amended, Dep 8 (NC)	48 I	New Ind	Old 3 + 18
10 D	Amended	Text amended, Dep 8 (NC)	49 I	New Ind	Old 1 + 20
11 D	Amended	Text amended, Dep 8 (NC)	50 I	New Ind	Old 3 + 20
12	Cancelled		51 I	New Ind	Old 1 + 21
13 MD	Amended; Dep to MDep	Text amended, 12 > 45,46,65,66	52 I	New Ind	Old 3 + 21
14 D	Amended	Text amended, Dep 13 (NC)	53 I	New Ind	Old 1 + 22

15 D	Amended	Text amended, Dep 13 (NC)	54 I	New Ind	Old 3 + 22
16 D	Amended	Text amended, Dep 13 (NC)	55 I	New Ind	Old 1 + 23
17 MD	Amended	Text amended, Dep 1 - 4 (NC)	56 I	New Ind	Old 3 + 23
18	Cancelled		57 I	New Ind	Old 1 + 24
19 MD	Amended	Text amended, Dep 1 - 4 (NC)	58 I	New Ind	Old 3 + 24
20	Cancelled		59 I	New Ind	Old 25 + 28
21	Cancelled		60 I	New Ind	Old 26 + 28
22	Cancelled		61 I	New Ind	Old 25 + 29
23	Cancelled		62 I	New Ind	Old 26 + 29
24	Cancelled		63 I	New Ind	Old 1 + 2 + 7
25	Cancelled		64 I	New Ind	Old 3 + 4 + 7
26	Cancelled		65 I	New Ind	Old 1 + 2 + 12
27	Cancelled		66 I	New Ind	Old 3 + 4 + 12
28	Cancelled		67 I	New Ind	Old 1 + 2 + 18
29	Cancelled		68 I	New Ind	Old 3 + 4 + 18
30 MD	Amended	Text amended, Dep 1 - 4 (NC)	69 I	New Ind	Old 1 + 2 + 20
31	Cancelled		70 I	New Ind	Old 3 + 4 + 20

32 D	Amended	Text amended, Dep 30 (NC)	71 I	New Ind	Old 1 + 2 + 21
33 D	Amended	Text amended, Dep 19 (NC)	72 I	New Ind	Old 3 + 4 + 21
34 MD	Dep to MDep	Text amended; 20>49,50,69,70	73 I	New Ind	Old 1 + 2 + 22
35 MD	Dep to MDep	Text amended; 21>51,52,71,72	74 I	New Ind	Old 3 + 4 + 22
36 MD	Dep to MDep	Text amended; 22>53,54,73,74	75 I	New Ind	Old 1 + 2 + 23
37 MD	Dep to MDep	Text amended; 23>55,56,75,76	76 I	New Ind	Old 3 + 4 + 23

38 MD	Dep to MDep	Text amended; 24>57,58,77,78	77 I	New Ind	Old 1 + 2 + 24
39	Cancelled		78 I	New Ind	Old 3 + 4 + 24

It is noted that new independent claims 43 - 58 are independent claims that incorporate all of the limitations of their respective base claims (claims 1 or 3), and new independent claims 63 - 78 are independent claims that incorporate all of the limitations of their respective base claims (claims 1 + 2, or 3 + 4), according to the previous form of base claims 1 - 4, which is the basis upon which the Examiner indicated their allowability, not based on the hereinabove amended versions of claims 1 - 4, of which claims 1 and 3 are amended herein to overcome the Examiner's rejection of those claims in order to obtain their allowance in their own right.

In the Office Action, previous claims 1 - 4, 25 - 26, 30 - 32, and 42 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,434,265 to Xiong et al ("Xiong et al").

In the Office Action, previous claims 19, 27,33, and 39 were rejected under 35 U.S.C. 103(a) as being unpatentable over Xiong et al.

In the Office Action, previous claims 5 and 17 were rejected under 35 U.S.C. 103(a) as being unpatentable over Xiong et al and further in view of U.S. Patent 5,706,417 to Adelson ("Adelson").

In the Office Action, previous claim 6 was rejected under 35 U.S.C. 103(a) as being unpatentable over Xiong et al and further in view of U.S. Patent 5,493,677 to Balogh ("Balogh").

Applicants respectfully disagree with all of these foregoing bases for rejection and traverse with the following arguments.

The reference of Xiong et al. discloses a method and apparatus of creating virtual reality panoramas, which can form a 3-D panoramic image from a plurality of images by removing unconformities as shown by 112 in Fig. 1(a) through the use of perturbation image processing such as affine transformation.

On the contrary, the present invention, irrespective of forming the 3-D panoramic image, specifies or selects common areas existing on two images, determines difference (deformation) between the selected areas, and deforms one or both of the two images in order to fill the difference with a display of two images as deformed. In other words, the difference from Xiong et al's system for generating the "smooth successive representation" of panoramic images lies in that the system of the present invention is designed to create a pseudo 3-D space representation with two separate images superposed on each other. The "state of images separated from and superposed on one another" is expressed by the wording "pseudo 3-D collage" as used in the present application. Therefore, the present invention is quite different from that of Xiong et al's system in both its purpose and construction.

A final image synthesized by the method of the present invention is different from a panoramic image and has the feature wherein one image matches with the other image only by a common specified area and has the remaining part deformed through affine transformation for making the common area match with that of the other image. The image is displayed in the state having the portion deformed through affine transformation and the common specified area matched with that of the other image.

With the method of the present invention that "selects common areas each existing on two images, determines a difference (deformation) between two common areas and deforms one image or both images to minimize the difference between the areas and displays two images as deformed", it is possible to provide a pseudo representation of free movement in which a rotation is combined with movements in the longitudinal and transverse directions, which cannot be accomplished by the method of Xiong et al. The panoramic image generating method disclosed in Xiong et al is basically able to represent only rotational movement from one position.

Furthermore, according to the present invention, it is possible to superpose a theoretically unlimited number of images on an image, which cannot be done using the Xiong et al method. In addition, according to the present invention, it is further possible to build up a system which superposes in real time a new image that is successively updated, for example, a picture representing a change from night to

daytime. In contrast to the system of Xiong et al for generating “smooth successive representation” of panoramic images, the present invention system for “generating a state with two separate images are superposed on each other” can possess extremely high flexibility and expandability of its representation and application. The method of Xiong et al cannot easily handle situations where there is an unconformity of the images, for example, a change from a night picture to a daytime picture.

In order for Xiong et al to anticipate the present invention under 35 U.S.C. 102(e), it must identically disclose an invention containing each and every element of the present invention. Xiong et al does not meet this requirement, therefore, Xiong et al cannot anticipate the present invention, as recited according to the claims now pending in the present application.

The following comparative analysis compares certain of the elements of the system of Xiong et al, as disclosed therein and as claimed according to claim 1 of Xiong et al, with the elements of the system of the present invention, as taught in the present application and as recited according to claim 1 of the present application, as amended herein above.

The system of Xiong et al utilizes a pairwise registration function module, which includes, *inter alia*, a projective matrix, to perform pairwise registration of images and generate a Hessian matrix.

The system of the present invention does not include the above elements. In contrast, the system of the present invention, as taught in the present application, and as claimed according to claim 1 of the present application, has a specified area associating means for associating one or more sets of areas specified on a first image, with one or more sets of areas on at least one other image, as common areas.

The system of Xiong et al further includes a calibration and global optimization function module for calibration and global optimization of output data from the pairwise registration module; a blending function module for generating at least one panorama from the output data of the pairwise registration module and the calibration and global optimization module; and a projection function module for forming a panorama from the images.

The system of the present invention does not include any of the above elements. In contrast, the system of the present invention, as taught in the present application, and as claimed according to claim 1 of the present application, has an image transforming means for transforming one or both images into matched common areas specified on the images; and an image display means for displaying both images superposed on each other after transformation of at least one of the images.

Certain specific embodiments of Xiong et al utilize a multi-level Gaussian pyramid formation function in its pairwise registration function module, as disclosed

in Xiong et al, and as claimed according to certain dependent claims therein, such as claim 9; a Laplacian pyramid construction function in its blending function module to generate the panorama from output data of images having overlap region, as disclosed in Xiong et al, and as claimed according to certain dependent claims therein, such as claim 20; and a variety of potential geometric models in its projection function module, to form the panorama, as is disclosed in Xiong et al, and as is claimed according to certain dependent claims therein, such as claim 23.

In contrast, no embodiments of the system of the present invention utilize any of the above features. In contrast, the system of the present application teaches and claims, as in herein above amended claim 1 of the present application, the use of an image transforming means for transforming one or both images into matched common areas specified on the images, using affine transformation; and an image display means for displaying both images superposed on each other after transformation of at least one of them.

Certain embodiments of the present invention, as disclosed in the present application and as claimed according to certain of the other claims in the present application, as amended herein above, relate to further aspects of the pseudo 3-D space representation system, including its use in a game system, an electronic map display system, and a navigation system, all of which are not taught, disclosed,

and/or claimed in Xiong et al, and which, therefore, cannot be said to be anticipated by Xiong et al.

Based on the foregoing comparative analysis of at least certain aspects of the systems of Xiong et al and the present application, it can be seen that Xiong et al does not anticipate the invention of the system of the present application within the requirements of 35 U.S.C. 102(e). It is respectfully requested that the Examiner withdraw such rejection. Accordingly, claims 1 - 4, and 30 - 32, presently remaining in the application, as amended herein above, of those claims specifically rejected by the Examiner as being anticipated by Xiong et al (of which claims 25, 26, and 42 have been cancelled) are believed to now be allowable. Moreover, any and all new claims added to the present application by this Amendment are believed to patentably distinguish over and be allowable over Xiong et al.

Adelson relates to an apparatus for generating a digital representation of a two-dimensional image sequence recorded in a plurality of frames. The apparatus, as disclosed in Adelson, and as claimed according to claim 1 of Adelson, includes, *inter alia*, means for separating an image sequence into a plurality of layers, wherein each layer corresponds to at least a portion of one object in an image in the sequence; means for generating an intensity map corresponding to each layer, with each intensity map at least partially describing the layer at a fixed point in time; means for generating at least one attenuation map corresponding to a layer and describing

a manner of attenuating points in the intensity maps of underlying layers; and data processing means including means for generating a velocity map associated with a layer of the image and describing how the intensity map and the attenuation map of the associated layer is warped with time.

Other embodiments of the apparatus of Adelson, as disclosed therein, and as claimed according to certain dependent claims therein, also provide for the generation of one or more of a delta map (claim 18), which describes the temporal derivative of points in the intensity map of the corresponding layer; a contrast change map (claim 5), describing changes in contrast of the intensity map of the associated layer as a function of time; a blur map (claim 5), describing a space variant filter describing blur in the intensity map of the associated layer; and a surface orientation map (claim 5), describing surface normals of the intensity map of the associated layer.

In contrast, the system of the present invention, as taught in the present application and as claimed according to the pending claims in the application, as amended herein above, does not utilize any of the foregoing map elements and features.

Whereas Adelson relates to digitally representing a moving image composed of a sequence of images, the system of the present invention is directed to representing a 3-D space with a plurality of 2-D images.

With regard to previous claims 5 and 17 of the present application, to which the Examiner applied Adelson in combination with Xiong et al, in an obviousness type rejection pursuant to 35 U.S.C. 103(a), whereas Adelson encodes an image as a series of layers, the system of the present invention as claimed according to claim 5 has a transparency specifying means for specifying the transparency of one image respective to another, such that the image display means displays the images according to the transparency of the image, e.g., specifying that successively more transparent images are superposed upon one another, with the least transparent image being at the bottom and the most transparent image on the top. This is a completely different operation and feature from encoding a single image as a plurality of layers, and including the generation of a velocity map which describes how all points in a layer are warped over time, as is done in Adelson. With regard to claim 17, the system of the present invention enables the specification to the image display means of a sequence or succession of displaying two or more images in a specified order, e.g., as in a action simulation version of the system of the present invention, such as in a gaming system, where a sequence or succession of images are displayed to represent action or motion. This too is a completely different operation and feature from what Adelson discloses it is capable of doing.

Accordingly, Adelson in combination with Xiong et al, does not render obvious the system of the present application, as recited according to either of claims

5 or 17, each as amended herein above, of the present application. Furthermore, there is nothing in either Xiong et al or Adelson that teaches or suggests their combination. Moreover, even if Adleson and Xiong et al are combined, the result is different from the system of the present application.

In view of the foregoing, it is respectfully requested that the rejection of claims 5 and 17 for obviousness over Xiong et al in view of Adelson be withdrawn by the Examiner.

Accordingly, claim 5 and 17, as amended herein above, previously specifically rejected by the Examiner as being obvious over Xiong et al in view of Adelson, are believed to now be allowable. Moreover, any and all new claims added to the present application by this Amendment are believed to patentably distinguish over and be allowable over Xiong et al. in combination with Adelson.

Balogh et al relates to a system for archiving and retrieving images. The system processes digitized images pertaining to metadata associated with the images, using a natural language processing database. The images and metadata are stored in a database. The system accepts a system user query, processes it by natural language processing against the metadata, and displays the images associated with the metadata found to match the user query. The system of Balogh et al includes an ingestion center with a data entry device, a natural language processing database, and a disambiguation processor; and an image center with an upload processor for

receiving an image and its associated metadata; a database connected therewith, and a browser connected to the database for viewing a subset thereof.

In Balogh et al, the metadata is associated with an image, and is searchable, but it does not constitute an actual part of the image.

With regard to previous claim 6 of the present application, which the Examiner has specifically rejected as being obvious over Xiong et al in view of Balogh et al, the system of the present application includes means in the image display means for displaying the metadata associated with an image when the image is displayed, however, the system of the present application does not include a searchable natural language processing database for searching the metadata prior to display of an image, and for actually acting as a means of selecting certain images from the database based on their metadata content and a match of that metadata content with a natural language query input to the system, as is the case in Balogh et al. The systems of the present application and that of Balogh et al are therefore completely different in their purposes, construction, and capabilities.

Accordingly, Balogh et al in combination with Xiong et al, does not render obvious the system of the present application, as recited in claim 6, as amended herein above. Furthermore, there is nothing in either Xiong et al or Balogh et al that teaches or suggests their combination. Moreover, even if Balogh et al and Xiong et al are combined, the result is different from the system of the present application.

In view of the foregoing, it is respectfully requested that the rejection of claim 6 for obviousness over Xiong et al in view of Balogh et al be withdrawn by the Examiner.

Accordingly, claim 6, as amended herein above, previously specifically rejected by the Examiner as being obvious over Xiong et al in view of Balogh et al, is believed to now be allowable. Moreover, any and all new claims added to the present application by this Amendment are believed to patentably distinguish over and be allowable over Xiong et al. in combination with Balogh et al.

Additional Claims Fees

After amendment, there are 38 Independent claims, 10 Dependent claims, and 14 Multiple Dependent claims in the application. The total number of dependent claim, including all multiple dependencies, is 86 dependent claims. Based on this total number of dependent claims and 38 independent claims, there are 124 claims in the application after amendment.

Prior to amendment, there were 4 Independent claims, 21 Dependent claims, and 17 Multiple Dependent claims in the application. The total number of dependent claims previously in the application, including all previous multiple dependencies, was 130 dependent claims. Based on that total number of dependent claims and the 4 independent claims, there were previously a total of 134 claims in the application.

New claims fees for the present Amendment are as follows:

38 independent claims after amendment less 4 independent claims previously paid for
= 34 extra new independent claims

34 x \$43.00 (Applicants have Small Entity status) = \$1,462.00

124 total claims after amendment less 134 total claims previously paid for = 0 extra

The fee for multiple dependent claims was previously paid for.

Additional claims fees for this Amendment are therefore \$1,462.00. Please charge this amount to Deposit Account No. 10-1250.

Request for Extension of Time

Applicants respectfully request a one month extension of time for responding to the Office Action. Please charge the fee of \$55.00 for the extension of time to Deposit Account No. 10-1250. Applicants have Small Entity status.

In light of the foregoing, the application is now believed to be in proper form for allowance of all claims and notice to that effect is earnestly solicited. Please charge any other fees due with the filing of this Amendment or credit any overpayments to Deposit Account No. 10-1250.

Respectfully submitted,

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